STATUTORY DECLARATION

I, Sun Suk KIM, a citizen of the Republic of Korea and a staff member of Y.H.KIM INTERNATIONAL PATENT & LAW OFFICE specializing in "ELECTRODE OF PLASMA DISPLAY PANEL", do hereby declare that:

(1) I am conversant with the English and Korean languages and a competent translator thereof.

(2) To the best of my knowledge and belief, the following is a true and correct translation of the Priority Document (No. P1999-52534) in the Korean language already filed with Korean Industrial Property Office on November 24, 1999.

Signed this 11th day of June, 2004

Sun Suk KIM

PATENT APPLICATION

DOCUMENT NAME: PATENT APPLICATION

TO: COMMISSIONER

DATE: November 24, 1999

TITLE OF THE INVENTION: ELECTRODE OF PLASMA DISPLAY PANEL

APPLICANT(S): LG. ELECTRONICS. INC

ATTORNEY(S)

Soo Woong LEE

Eui Chang HWANG

INVENTOR(S)

Name: Hun Gun PARK

Address: Ga-406, Woosuk Apt, #2, Gongdan-dong, Gumi-si, Gyoungsangbuk-do, Korea

Nationality: Republic of Korea

The present application is filed pursuant to Article 42 of the Korea Patent Act.

Patent Attorney

Soo Woong LEE

Eui Chang HWANG

ABSTRACTS

[Abstract]

The present invention relates to an electrode of a plasma display panel.

In an electrode of a plasma display panel including a lower substrate, having a plurality of barrier ribs with a fluorescent material which each barrier rib is arranged in parallel, and a upper substrate, sealed to an upper side of the lower substrate and having a transparent electrode and a bus electrode, wherein the transparent electrode has a integral discharge prevention part for preventing a partial discharge in both ends thereof.

Thus, the plasma display panel prevents a discharge and a light emission in accordance with the discharge in a non-display part not an effective display part, thereby reduce a power consumption and improve a contrast.

[Representative drawing]

FIG. 4

SPECIFICATION

[Title of the invention]

ELECTROAD OF PLASMA DISPLAY PANEL

[Brief description of the drawings]

FIG. 1 is a disassembled perspective view showing a related art plasma display panel;

FIG. 2 is a sectional view illustrating a combined plasma display panel of FIG. 1;

FIG 3 is a plan view illustrating that a sustaining electrode is installed on the related art plasma display panel;

FIG. 4 is a perspective view of a plasma display panel according to the present invention; and

FIG. 5 is a plan view illustrating that a sustaining electrode is installed on the plasma display panel according to the present invention.

<Detailed description of the reference numerals>

10 and 20 : an upper substrate and a lower substrate
11 : a sustaining electrode
11a : a transparent electrode
11b : a bus electrode
11c : a discharge prevention part
12 : an upper dielectric layer
13 : protective film
21 : a barrier rib

[Detailed description of the invention]

[Object of the invention]

[Technical field including the invention and prior art therein]

The present relates to an electrode of a plasma display panel, and more particularly, to an electrode of a

plasma display panel capable of preventing a discharge and a light emission pursuant to the discharge in a non-display part excluding an effective display part, thereby reducing a power consumption and improving a contrast of the plasma display panel.

In recent, a development of a high definition television has been partially completed. During a research progress for an improved scheme of the high definition television, an importance for a picture display device (or an image display device) has been remarkably raised. As known in the art, the picture display device includes a cathode ray tube (CRT), a liquid crystal display (LCD), a fluorescent display device (VFD) and a plasma display panel (PDP).

However, since the display devices do not satisfy the requirement of the high definition television, the picture display devices have been developed with a correlation in separate technical fields.

Among these picture display devices, the PDP displays a picture by using a gas discharge and is used for a television, a monitor and an internal or an external advertising display device because it has properties such as a high resolution, an illumination ratio, and a rapid response speed as well as a suitability of displaying a large-scale picture.

FIGs. 1 and 2 illustrate a disassembled perspective view of a related art plasma display panel and a combined section view of the related art plasma display panel shown in FIG. 1, wherein a lower substrate shown in FIG. 2 shows a state that an upper substrate is rotated by an angle of 90°.

That is, in the plasma display panel, an upper substrate 10, which is a display surface for displaying a picture, is combined to a lower substrate 20 spaced by a designated distance in parallel each other.

A lower portion of the upper substrate 10 includes a

sustaining electrode 11 for sustaining a light emission of a cell by a mutual discharge in one pixel. That is, the sustaining electrode 11 includes a couple of a transparent electrode (or a ITO electrode) 11a and a bus electrode 11b. The transparent electrode 11a is made of a transparent ITO and the bus electrode 11b is made of metallic material. The sustaining electrode 11 is covered with an upper dielectric layer 12 which serves to limit a discharge current and insulate the pair of electrodes from each other. On an upper surface of the upper dielectric layer 12, a protective film 13 is formed.

On the lower substrate 20, barrier ribs 21 of a stripe type for forming a plurality of discharge spaces, i.e., a plurality of discharge cells, are arranged in parallel and a plurality of address electrodes 22 is arranged in parallel to the barrier ribs 21 and performs an address discharge at an area intersecting the sustaining electrode 11 to generate a vacuum violate ray.

An upper surface of the lower substrate is applied with R, G, and B fluorescent materials 23 radiating visible rays for a picture display in an area except an upper surface of the barrier rib 21 at the time of the address discharge.

A process of displaying the picture of the related art PDP having a configuration as described above will be explained as follows.

If a voltage of 150V ~ 300V is supplied to the sustaining electrode 11 and the address electrode 22 in a certain discharge cell, then a writing discharge is occurred within the cell positioned between the sustaining electrode 11 and the address electrode 22, and a wall charge is formed an inside surface of a discharge space of the discharge cell.

Thereafter, if a sustaining discharge voltage is supplied to the sustaining electrode 11, then a sustaining discharge is easily occurred by the wall charge, formed at

the address discharge, between the address electrode 22 and the sustaining electrode 11, and a light emission of the cell occurring the writing discharge is maintained during a designated time period.

That is, an electric field is generated in the cell by the discharge between the electrodes, which causes to accelerate a very small amount of electrons in discharge gases. These accelerated electrons collide with neutral particles of the discharge gases. By these collisions, the neutral particles are ionized into electrons and ions. The ionized electrons make another collision with the neutral particles and thus the neutral particles are rapidly ionized into electrons and ions to be a plasma state and, at the same time, to generate vacuum ultraviolet rays.

These vacuum ultraviolet rays excite the fluorescent materials 23 to generate visible lights. The generated visible lights are radiated externally through the upper substrate 10, so the light emission from the discharge cell can be recognized at exterior as displayed pictures.

Thereafter, if a discharge voltage of more than 150V is supplied to the sustaining electrode 11, then a sustaining discharge is occurred between the sustaining electrodes 11 in the cell, and a light emission from the cell is maintained during a designated time period.

However, the sustaining electrode of the plasma display panel exhibits a problem as follows.

As described above, the sustaining electrode 11, including the transparent 11a and the bus electrode 11b, is extended in parallel up to an outer region of the barrier rib 21 positioned at the edge of the lower substrate 20. Due to the configuration, a discharge is occurred by the discharge voltage supplied to both ends of the sustaining electrode 11 at all regions where the sustaining electrode 11 exists.

However, the discharge is occurred much more in a part without having the fluorescent materials 23 and a part

without having the barrier rib 21 (or a non-display part, not an effective display part).

Thus, as shown FIG. 3, in the configuration that the sustaining electrode is extended up to the outer region of the barrier rib, i.e., an non-display part positioned at the outermost edge of the lower substrate, not an effective display part to be light-emitted by a discharge, there occurs a problem that a power consumption is increased. Also, the configuration has another problem that a contrast is deteriorated because the light is diffused and is emitted at the non-display part of the screen.

In addition, as marked with 'A' in FIG. 3, since corner parts, i.e., edge parts of the transparent electrodes faces each other, an electric field is concentrated on the corner parts. As a result, there exists a possibility of a breakdown of the transparent electrode.

[Technical Subject Matter to be solved by the Invention]

Accordingly, it is an object of the present invention to provide a plasma display panel capable of improving a contrast of a display by preventing an unnecessary discharge in a configuration that the sustaining electrode is extended up to the outer region of the barrier rib positioned at the edge of the lower substrate, not an effective display part of the plasma display panel, to thereby reduce a power consumption and cut-off an emission of light pursuant to the discharge.

It is another object of the present invention to provide a plasma display panel capable of preventing a concentration of an electric field at an end part of a transparent electrode in a sustaining electrode and removing a breakdown of a transparent electrode.

[Configuration and Operation of the Invention]

In order to achieve these and other objects of the invention, the present invention provides an electrode of a

plasma display panel including a lower substrate, having a plurality of barrier ribs with a fluorescent material which each barrier rib is arranged in parallel, and an upper substrate, sealed to an upper side of the lower substrate and having a transparent electrode and a bus electrode, wherein the transparent electrode has an integral discharge prevention part for preventing a partial discharge in both ends thereof.

In the electrode of the plasma display panel, the discharge prevention part includes an inclination surface formed to incline toward the bus electrode from an inside of the transparent electrode adjacent to an outside of the barrier rib arranged at an edge.

In another embodiment of the present invention, the inclination surface is a large radius curvature.

These and other objects of the invention will be apparent from the following detailed description of the embodiments of the present invention with reference to the accompanying drawings.

For the sake of simplicity, elements identical to those in the related art will be assigned by the same reference numerals.

FIG. 4 is a disassembled perspective view illustrating a plasma display panel according to a first embodiment, and FIG. 5 is a plan view illustrating that a sustaining electrode is installed on the plasma display panel according to the present invention

As shown FIGs. 4 and 5, a plasma display panel according to the present invention includes an upper substrate 10 and a lower substrate 20 which are combined in parallel by a designated distance.

A sustaining electrode 11 is arranged on a lower portion of the upper substrate 10. The sustaining electrode 11 includes a transparent electrode 11a and a bus electrode 11b for sustaining a light emission of a cell.

The sustaining electrode 11 is covered with an upper

dielectric layer 12 and a protective film 13 formed through a firing process. On a lower portion (or a rear portion) of the sustaining electrode 11, the lower substrate 20 is installed. Such a configuration is almost identical to that of the related art plasma display panel as described above.

According to the present invention, the transparent electrode 11a of the sustaining electrode 11 is integrally formed with a discharge prevention part 11c for preventing a partial discharge in both ends thereof.

The discharge prevention part 11c includes an inclined surface formed to incline toward the bus electrode 11b from an inside of the transparent electrode 11a protruded from an outside of the barrier rib 21.

It is preferable that the inclined surface has a large radius curvature.

An operation of the present invention having the configuration will be described as follows.

If a voltage of 150V ~ 300V is supplied to the sustaining electrode 11 and the address electrode 22 in a discharge cell, then a writing discharge is occurred in the cell positioned between the sustaining electrode 11 and the address electrode 22, and a wall charge is formed at an inside surface of the discharge space of the cell.

Thereafter, if a sustaining discharge voltage is supplied to the sustaining electrode 11, then a sustaining discharge is easily occurred by the wall charge, formed at the address discharge, between the address electrode 22 and the sustaining electrode 11, and a light emission of the cell occurring the writing discharge is maintained during a designated time.

That is, an electric field is generated in the cell by the discharge between the electrodes, which causes to accelerate very small amount of electrons in discharge gases. These accelerated electrons collide with neutral particles of the discharge gases. By these collisions, the neutral particles are ionized into electrons and ions. The

ionized electrons make another collision with the neutral particles and thus the neutral particles are rapidly ionized into electrons and ions to be a plasma state and, at the same time, to generate vacuum ultraviolet rays.

These vacuum ultraviolet rays excite the fluorescent materials 23 to generate visible lights. The generated visible lights are radiated externally through the upper substrate 10, and the light emission of the discharge cells can be recognized at an exterior as displayed pictures.

Thereafter, if a discharge voltage of more than 150V is supplied to the sustaining electrode 11, then a sustaining discharge is occurred between the sustaining electrodes 11 in the cell, and a light emission of the cell is maintained during a designated time. Such operations are identical to those of the related art plasma display panel as described above.

According to the present invention, because the discharge prevention part 11c, installed to be integral with the transparent electrode 11a of the sustaining electrode 11 protruded to an outside of the barrier rib 32, i.e., an non-display part of an effective display part, a discharge does not occur in that part.

More specifically, the transparent electrode 11a of the sustaining electrode 11 formed at the non-display part includes the discharge prevention part 11c having an inner side rounded toward the bus electrode 11b. Since a distance between the discharge prevention parts 11c is larger at the non-display part, a discharge does not generated at the non-display part. That is, a discharge and a light-emission pursuant to the discharge do not occur in that part where the discharge prevention part 11c is installed.

In the related art, there is a problem that an light emission by a discharge is occurred in the sustaining electrode extended up to an outer portion of a barrier rib positioned in an outermost edge of a lower substrate, not an effective display part, and a power consumption by a

deterioration of a contrast and a discharge is increased in accordance with the emission. However, according to the present invention, it is possible to solve the problem as described above by installing the discharge prevention part.

Further, according to the present invention, it is possible to solve the problems existing in the prior art that an electric field is concentrated into a corner of end parts of a transparent electrode and there exists a possibility of a breakdown of the transparent electrode due to the electric field.

[Effect of the Invention]

As described above, the present invention is capable of improving a contrast of a display by preventing an unnecessary discharge in a structure that the sustaining electrode is extended up to the outer region of the barrier rib positioned at the edge of the lower substrate, not an effective display part, to reduce a power consumption and cutting-off an emission of light in accordance with the discharge.

Also, the present invention prevents a concentration of an electric field at end parts of a transparent electrode in a sustaining electrode and removes a possibility of a breakdown in accordance with the concentration of the electric field.

Although the present invention has been explained by the embodiments shown in the drawings described above, it should be understood to the ordinary skilled person in the art that the invention is not limited to the embodiments, but rather that various changes or modifications thereof are possible without departing from the spirit of the invention. Accordingly, the scope of the invention shall be determined only by the appended claims and their equivalents.

[What is claimed is:]

1. An electrode of a plasma display panel including a lower substrate having a plurality of barrier ribs arranged in parallel with a fluorescent material, and an upper substrate combined to an upper side of the lower substrate and having a transparent electrode and a bus electrode, wherein the transparent electrode is integrally formed with a discharge prevention part for preventing a partial discharge in both ends of an outer portion of an efficiency display.

2. The electrode of the plasma display panel according to claim 1, wherein the discharge prevention part includes an inclined surface formed to incline toward the bus electrode from an inside of the transparent electrode protruded from an outside of the barrier rib.

3. The electrode of the plasma display panel according to claim 1, wherein the inclined surface has a large radius curvature.

FIG.1

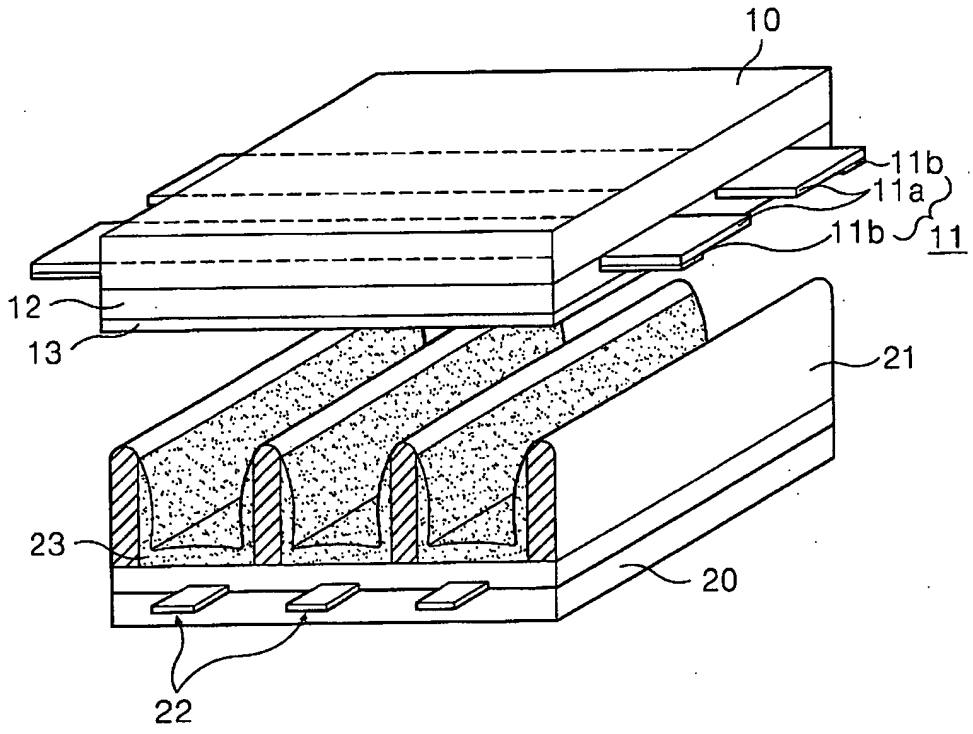


FIG.2

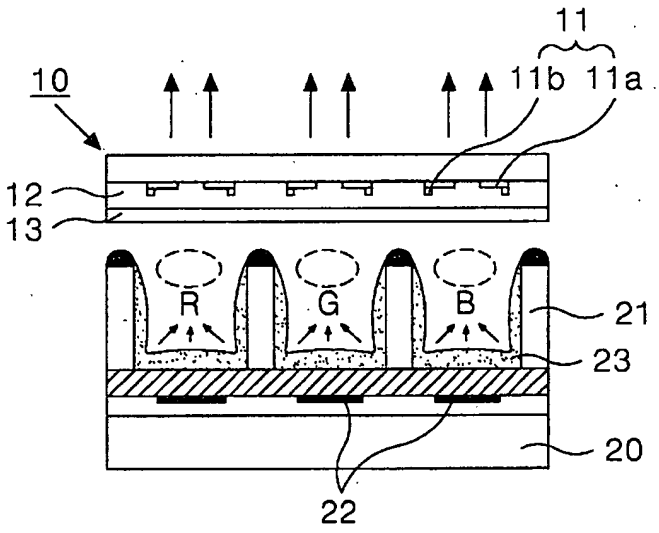


FIG.3

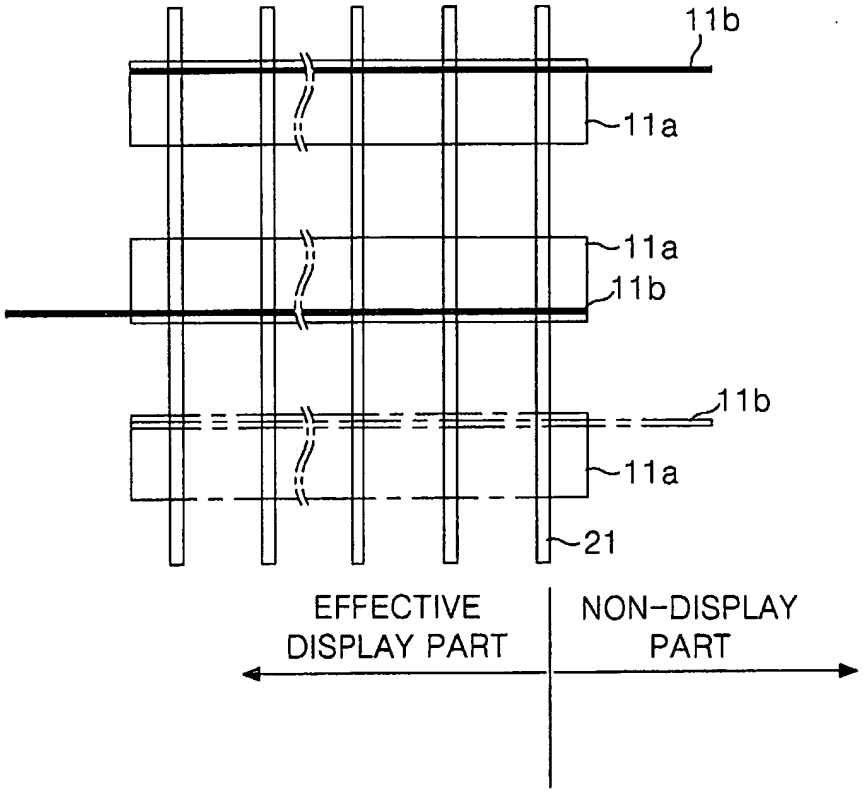

11b
11a
11a
11b
11b
11a
21
EFFECTIVE DISPLAY PART
NON-DISPLAY PART

FIG.4

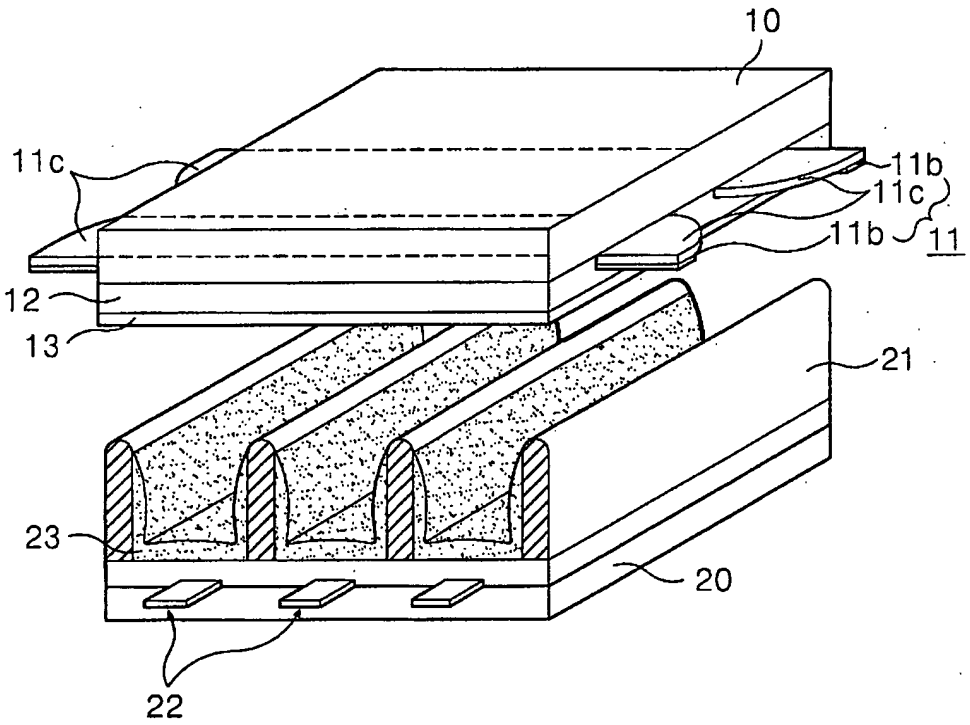
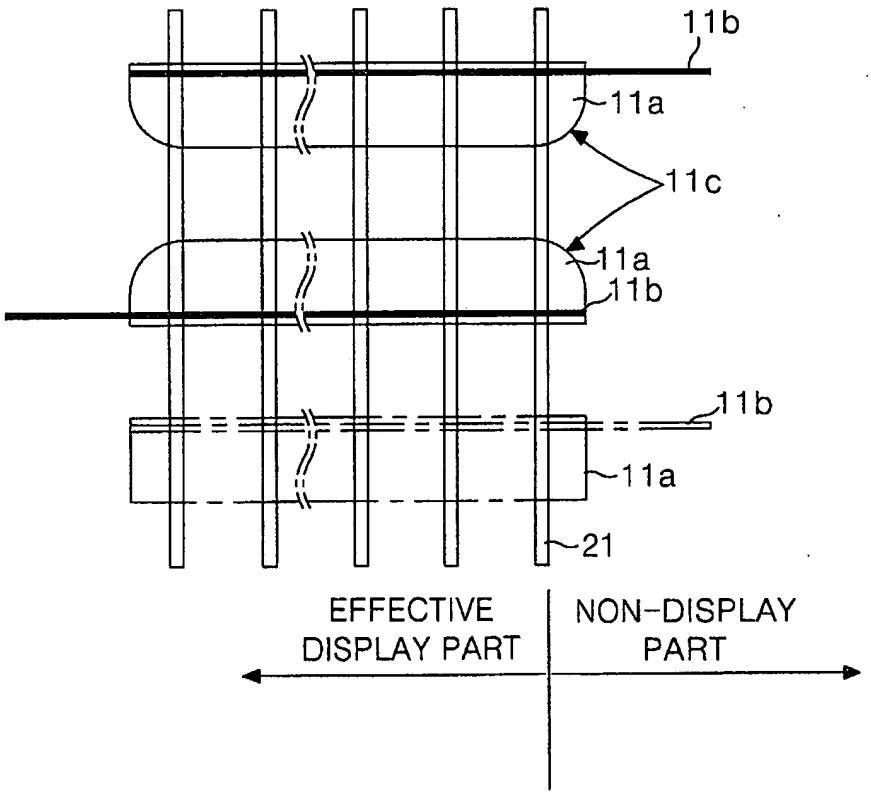


FIG.5


11b
11a
11c
11a
11b
11b
11a
21
EFFECTIVE DISPLAY PART
NON-DISPLAY PART